

Position of European Bioplastics

SOUND LCA AS A BASIS FOR POLICY FORMULATION

Challenges and limitations in using LCA methodology to evaluate innovative technologies

In recent years, policymakers have become increasingly reliant on the use of Life Cycle Assessments (LCA) to establish a proper basis for more transparent and evidence-based decision-making on policies and regulation. However, successful LCAs must take into account a number of considerations in terms of how they influence the final result and policy support. These include data availability and quality, modelling approaches, methodological choices, and uncertainty analysis.¹

LCAs were originally devised as a means for businesses to identify hot spots and to leverage innovation in respect of a specific product and its development. In the policymaking process though, LCAs are instead used as a tool for comparison, specifically to evaluate diverse products or technologies that may not already have appropriate benchmarking. Here – and in particular when comparing innovations with established alternatives – significant challenges in terms of data availability and methodological choices are the norm rather than the exception.

Challenges in using LCAs to assess innovative technologies such as bio-based plastics

In the separate datasets most commonly used for conducting LCAs on fossil-based and bio-based plastics, substantial differences can be seen in the level of detail when considering input and output. These differences are also evident where datasets used to analyse the same products and processes are derived from the same primary data source. That said, comparative LCA studies that use different background databases can lead to misleading results and interpretations.

For a sound LCA comparison of bio-based plastics with other plastic materials (e.g. fossil, recycled, CO₂-based feedstock), it is necessary to consider:

EU and international climate change targets:

- Bio-based, recycled and CO₂-based plastics are all complementary material solutions, originally created

to support the climate change targets of the European Commission's 'A Clean Planet for All' 2018 strategy, which aims to achieve a carbon neutral economy by 2050, as well as the targets of the Paris Agreement. Each of these solutions offers benefits, and all of them are needed to combat climate change.

- ➔ **Recommendation: EU and international climate targets should be taken into account when benchmarking innovative plastics against conventional plastics. LCA studies should consider analysing innovative solutions in combination, and should seek to establish the best case scenario and conditions to achieve the climate change targets, comparing against the conventional material offerings that still predominate the market today.**

Bio-based plastics and fossil-based plastics are compared on an unequal basis in terms of production and conversion:

- While the bio-based plastics on the market are relatively new materials (10-20 years), fossil-based plastics are a more mature product (40-60 years).
- Bio-based plastics are produced in a limited number of rather small-scale facilities, unlike fossil-based plastic production, which is performed on a large, fully optimised basis.
- In contrast to the conversion of fossil-based plastics to products, making end products from bio-based plastics is mostly conducted at small scale, often on lines that are not fully dedicated and not running at full capacity.
- For many bio-based plastics, there are currently only one or two producers, who themselves have only entered the market in the last 20 years.

¹ European Commission, JRC Technical Reports, Sala S., Reale F., Cristobal-Garcia J., Marelli L., Pant R. (2016), *Life cycle assessment for the impact assessment of policies*, EUR28380 EN; doi:10.2788/318544, <https://ec.europa.eu/jrc/en/publication/life-cycle-assessment-impact-assessment-policies>

- ➔ **Recommendation:** Future improvements in the efficiency of bio-based plastics – in terms of feedstock sourcing, production, conversion, and end-of-life options – need to be adequately considered and forecast through the application of appropriate assumptions and modelling approaches. The underlying disparities should be described in the LCA's scope, interpretation, and evaluation.

For comparative LCAs, a level playing field is needed in respect of data sources and quality:

- Published life cycle inventories for fossil-based products (e.g. from Plastics Europe) cover only the environmental footprint of European manufacturing sites. For some materials, the majority of the production happens in other regions of the world resulting in a most likely higher environmental footprint. For European consumption, production outside of Europe is still important due to the need for imported products. This geographical difference is not reflected in the analysis if the appropriate regional datasets are not being used.
- Data sources also need to be screened to consider the scale of production they originate from: data relating to small pilot plants is not comparable to data from fully optimised major facilities.
- ➔ **Recommendation:** Fossil- and bio-based plastics datasets must be brought to the same level of quality in terms of completeness, system boundaries, regional scope, transparency, and modelling rules. Furthermore, they need to be made available via public databases. Data also needs to be compared at an equal scale; in the case of innovative technologies/industries operating at smaller scale, data needs to be equalised to take into account potential future maturing/development.

Carbon sequestration should be addressed with bio-based plastics:

- Bio-based plastics are produced from annually/bi-annually renewable feedstock that sequesters carbon from the atmosphere while it grows. This carbon is captured within the polymer/product until the end of the material's life. Once it can no longer be recycled, the carbon re-enters the natural carbon cycle via incineration or composting, thereby closing the material carbon loop.

- ➔ **Recommendation:** The uptake of atmospheric carbon and release of biogenic carbon should be included in the appropriate phase of the product's LCI. The uptake and release of biogenic carbon needs to be included in the LCA impact category of greenhouse gas emissions.

Modelling of indirect negative and indirect positive effects:

- For bio-based plastics, indirect negative effects (such as ILUC) are increasingly modelled in LCAs. In order to ensure a level playing field for the comparison process, indirect negative effects of fossil-based plastics also need to be considered.²
- In addition, LCAs should not only focus on negative impacts, but also account for indirect positive impacts, especially where these are of high relevance to a functioning circular economy.³
- ➔ **Recommendation:** A balanced approach needs to be adopted to address indirect negative impacts as well as indirect positive impacts. All compared materials (independent of feedstock) or products should be scrutinised for such effects, to ensure a level playing field.

Accurate reflection of end-of-life options for bioplastics:

- Bio-based plastics offer multiple end-of-life options, depending on the material chosen and the application at hand. Bottles made from bio-based PE can be mechanically recycled in existing recycling streams; bio-waste bags are made from biodegradable certified and compostable starch blends that can be recovered through organic recycling i.e. industrial composting.
- ➔ **Recommendation:** The selected end-of-life option needs to be realistic and product-specific.

Final remarks:

In order to address the challenges in using LCAs to evaluate innovations and formulate corresponding policy initiatives, EUBP urges the Commission to ensure accordance with ISO 14040/44 requirements to involve stakeholders when bringing comparative LCAs into the public domain.

² For example: military escort emissions for tankers, land occupation and spoiling. See also: V. Uusitalo and A. Enström : "Indirect global warming impacts from processes attributing to direct global warming and example of permafrost melting", published on www.european-bioplastics.org, December 2018

³ For example: the support of bio-waste collection with compostable bio-waste bags has been shown to increase the amount of separately collected bio-waste, which can then be used as valuable resource of compost and furthermore does not end up in landfills where it would produce methane, thereby contributing to global warming.

In EUBP's case, this would entail

- consulting EUBP and other relevant stakeholders throughout the entire process of an LCA study comparing bio-based plastic products with any other type of product used in the same applications;
- consulting EUBP and other relevant stakeholders in respect of the relevant scope decisions – for example, which functional units are chosen to allow for a meaningful comparison, which LCA methodological approach (e.g. allocation) is used, the applicability of different polymers and plastics (and the intended applications), and the assumed performance and quality indicators of these polymers covering the whole lifecycle from feedstock production through product use to end-of-life.
- a mandatory critical peer review involving all relevant stakeholder groups when making comparative assertions and policy decisions.

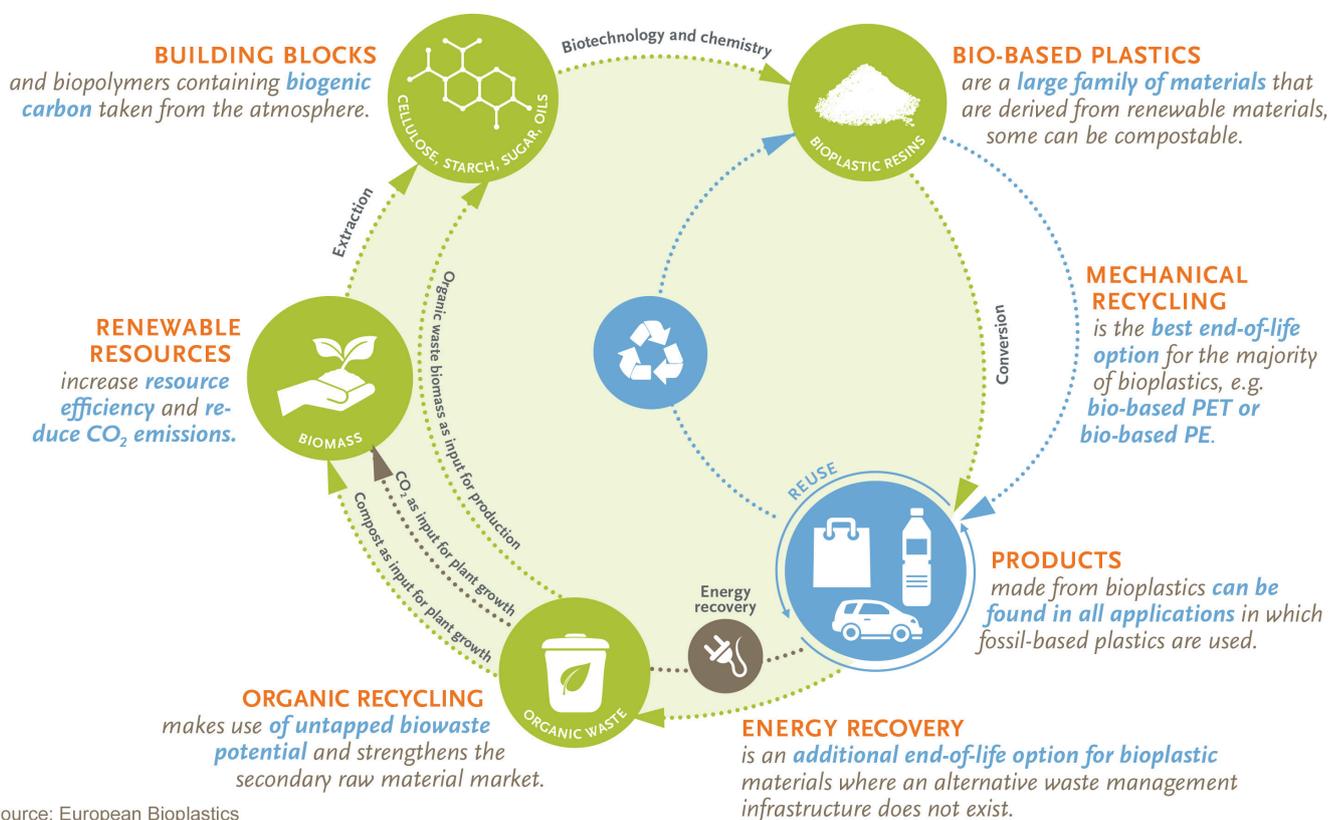
According to EuropaBio, the bio-based plastics industry accounts for 23% of jobs and growth potential in the European industrial biotechnology sector. Today, this amounts to 20,000-30,000 employees, but implementing the right framework conditions would result in steep employment growth and could create up to 300,000 high-skilled jobs by 2030⁴.

If current and future studies fail to address the specific challenges that LCAs pose to innovative technologies in general and the bio-based plastics industry in particular, the conclusions and policy formulation that arise from these studies may be distorted and would potentially have a negative impact on the European uptake of bio-based plastics and the associated employment growth potential.

About European Bioplastics

European Bioplastics represents the interests of more than 70 member companies throughout the European Union. With members from the entire value chain, European Bioplastics serves as both a contact platform and catalyst for advancing the objectives of the growing bioplastics industry. For further information, please visit <http://european-bioplastics.org>.

Bioplastics – closing the loop



⁴ EuropaBio, Study on Jobs & Growth in Industrial Biotech in the EU, 2016.